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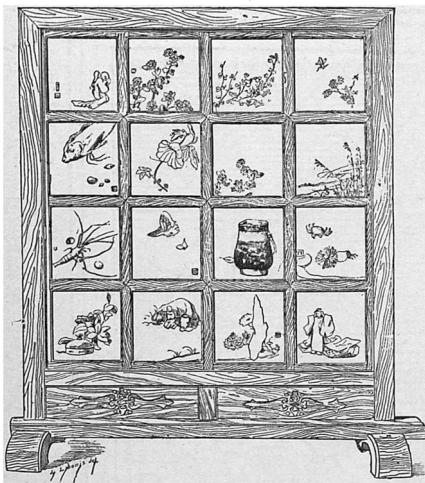
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DESIGN FOR A SCREEN.

THE CULTIVATION OF THE SILK WORM.

By J. HOWARD KITCHING.

FOR us who have grown accustomed to silk and silk fabrics, it is somewhat amusing to recall the ancient ideas concerning it and its production. Even as late as the first century of our era, Pliny affirmed that silk was a woolly substance combed from the leaves of trees and afterwards spun; others believed that it was obtained from the inner fiber of bark growing upon a certain species of tree or shrub, but although Aristotle had given a tolerably correct account of the caterpillar, describing the changes from worm to chrysalis, and from chrysalis to moth, no one dreamed of attributing to it the production of silk. Indeed, so jealously did the Orientals preserve the secret that it was not revealed to the western nations until the sixth century after Christ.

There is no doubt but what the discovery and use of silk began in China, and, if the Chinese historians are to be trusted, some 8,600 years ago. They have a curious legend concerning it, which runs as follows: "Their great prince, Hoang-ti, was desirous that Si-ling-chi, his legitimate wife, should contribute to the happiness of his people. He charged her to examine the silk worms and to test the practicability of using the thread. Si-ling-chi had a large quantity of these insects collected, which she fed herself in a place prepared solely for that purpose, and discovered not only the means of raising them but also the manner of reeling the silk and of employing it to make garments."

It is through gratitude for so great a benefit that posterity has deified Si-ling-chi, and rendered her particular honors under the name of "The Goddess of Silk Worms." To the present time it is said that the emperresses of China on a certain day of the year, go through the ceremony of feeding the silk worms and rendering homage to Si-ling-chi as "Goddess of Silk Worms."

For many centuries the Oriental nations concealed the source and processes by which silk was obtained, and the cities of Greece and Syria were obliged to pay such enormous prices for this material, that their silken fabrics were sold ounce for ounce for their weight in pure gold. About A. D. 555, however, two Nestorian monks, who had been missionaries in China, succeeded in bringing to Constantinople, at the peril of their lives, a small quantity of silk worm eggs concealed in their palmer staves, and from this period the culture of silk began in southern Europe. Through this thin outline of very interesting history, we approach the main question of interest to practical Americans, *i. e.* is silk culture in the United States feasible and profitable? In connection with the habits and treatment of the silk worm, I am able to give a few hints, as I have had some practical experience with them in Italy and Switzerland.

Silk worm raising and consequently the manufacture of silk is yet in its infancy in the United States, owing mainly to the fact that the worm is not indigenous to any part of the western continent, its principal center being Southern China, Japan, Turkey, and all through the Turkish territory in Asia, where the red and white mulberry tree (the leaves of which are the chief food of the silk worm) is found in greatest abundance.

However the finest silk is said to be obtained in Italy. As a rule the eggs of the silk worm moth in their natural state hatch in the spring. The different changes which take place consume the time until about September, when a new batch of eggs is laid, lying passive through the winter till the following spring. The eggs are about the size of a small pin head and of a dark bluish-black color. Strictly speaking, that is not the color of the egg but of the larva within, as the egg shell itself is a transparent white.

When the worm, or rather the caterpillar, first makes its appearance, it is not longer than the sixteenth part of an inch and quite black in color. It has often been my experience to have some of the eggs hatch before the mulberry leaves come out. In this case the leaf buds should be opened and the young leaves given to the larva. At intervals of from two to three weeks the worms change their skin, becoming after each change lighter in color, until about the end of August, when they are perfectly white. At this time they are from two and a half to three inches in length and as large as an ordinary lead pencil. During the changing of their skin the worms eat nothing, but assume a peculiar position; the head and greater part of the body being raised above the ground, or more literally speaking, the paper or leaf on which the worm may be standing. In this way they remain immovable until the outer coating has split or dropped off, when they begin to eat again. They are very voracious, one worm eating from one to three mulberry leaves, the size of a large grape leaf, in one day. They are kept on white paper trays, and are naturally very cleanly, so that by giving them sufficient food and keeping the trays in good condition the worms will not attempt even to wander away, but will always remain by their food. The disease most disastrous to the larva is the "muscardine," which is a sort of fungus growth and destroys great numbers of them every season.

I think, however, that where silk worms are raised in large numbers they are not always kept perfectly clean and consequently are more liable to disease. I raised silk worms for four years, and until the last season never saw any sign of the trouble. Even when it did make its appearance I did not allow it to make much headway, for by destroying the worms that were affected and keeping a watchful eye upon the rest the disease was checked. I have tried several experiments with a view of improving the silk, but though I occasionally fed one lot of the caterpillars on young lettuce and was able to get about the same quality of silk—perhaps a shade lighter yellow—I noticed that the larva would eat nothing else when they could get the mulberry leaf.

When the worm has attained its full growth it ceases to eat for about twelve hours. It is then placed among bare branches forming forks, so as to facilitate the spinning of its cocoon. The silk issues, in a double thread glued together, from a twin orifice in the nose, and not from the abdomen as in the spider. At first the worm spins from one branch to another and another, then back to the first, forming a square or a triangle as the case may be. This serves as a support or an envelope for the cocoon itself. By this time the larva has diminished to two-thirds its original size and assumes a creamy tinge. It gradually grows smaller as it discharges the silk which it is weaving in one continuous thread around itself. At last the larva is hidden in the golden egg-shaped ball, but the work goes on inside for about five or six hours more, when the larva goes gradually into the pupa or chrysalis state. The usual manner of collecting the silk is to throw half the cocoons into boiling water so as to kill the chrysalis, otherwise it would eat through and spoil the silk. The other half is kept for breeding purposes. When the moth emerges from the cocoon of course the silk is spoiled, as gnawing through cuts the continuous thread of which the cocoon is formed, and it cannot then be reeled off. There are uses for these, however, as well as for the silk that envelopes and supports the cocoon, but the value is slight in comparison with the perfect thread. After several tests I found that I could reel the silk from the cocoon and at the same time preserve the chrysalis for breeding. This of course largely increased my profits. The means I employed to unwind the silk was to first remove the floss which covers the cocoon, and then throw from twenty to thirty of them into tepid water, which softens the adhesive matter, which holds together the silk forming the cocoon, rendering the reeling much easier and the thread less liable to break. I then detached the thread from each cocoon and brought the ends together on the reel, setting the latter in motion. A feature of the process is that no matter where the end is broken from the cocoon, the silk will nevertheless unwind nearly to the end, or as near

the end as is necessary, on one long thread of from five hundred to one thousand feet, as if one had the end of a spool of cotton. One way of catching the ends of the silk is to twist a whisk broom among the cocoons and the loose ends of silk will adhere to the wisps, but I think it saves time to break an end off from any part of the cocoon.

Meanwhile the cocoons are floating on the water, and as the reel unwinds the thread they bob around, until the chrysalis is visible through a thin coating of very pale yellow silk, when reeling should cease. As the silk nearest the center is the last spun by the larva, it is consequently the thinnest and poorest, so that the small waste does not signify. The cocoons should then be taken from the water, the remaining silk cut away, and the pupa extracted, great care being taken not to injure the latter. I always reeled the silk off in skeins and did not find it necessary to clean it in any way, so it was all ready for sale. Meanwhile the larva has undergone a decided change since last seen. It is now hardly an inch long, with a brown shell or covering, through which only the eyes are seen, and in this state resembles more a miniature mummy than anything else. The only movable part is the tail, which tapers down to a point like the small end of a cigar. This pupa should then be buried about an inch deep in saw dust or bran, as it is very sensitive to the cold while thus bereft of its natural covering. As it takes about a week from the time the larva first spins its cocoon to the time when the silk may be removed without injuring the pupa, so also after the silk is reeled off, about a week will elapse before the silk worm appears in its last form, and for the last time, in the shape of a white or cream colored moth about an inch long, the male being decidedly smaller. A curious feature about these moths is that though provided with four wings like an ordinary moth they are incapable of flying, but fan their wings about incessantly and with great rapidity as they crawl about. Their existence ends after a few days, but before then each female lays from five to eight hundred eggs and sometimes more.

During the whole time in which I raised silk worms I never knew one of the moths to eat anything; they seem to emerge from the chrysalis only to lay their eggs and die. The best plan is to place the moths on large sheets of white or brown paper, as the eggs are adhesive, and in this way they are more portable. While fresh they are white, getting darker in color until they are almost black. As a rule they do not hatch until spring, though I have had them come out in mid-winter while packed in a trunk where the heat accelerated the hatching. Comparatively, few of the eggs prove worthless, so that a person with twenty or thirty eggs to start with can in a few seasons with proper care have thousands of cocoons.

It is said that by varying the food of the worm different colored silks can be obtained, but I doubt this, though a darker or lighter shade of silk than the usual yellow has sometimes come under my notice. As to the temperature to be maintained the usual summer warmth is what the silk worm in its natural state is accustomed to, and slight variations do not affect it, but the best way is to keep them in a room that admits of good ventilation, taking care, however, that water in no form, or even humidity of the air, should reach them.

I hope some day to see silk-worm raising form a more important industry in our country. In the south and southwest especially there is a large field for such enterprise, as the climate would greatly favor the undertaking. In California it seems to be growing rapidly into quite a branch of trade, and so it should with the advantages that part of the country offers. There is no reason why we who depend upon ourselves for everything, with but few exceptions, should continue to import such quantities of silk from Italy, China, Japan, or any other country.

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CHINA silks, hand embroidered in floss, are used for chair and sofa scarfs.